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REPORT FROM THE COMMISSION

**Quality of petrol and diesel fuel used for road transport in the European Union:
Third annual report
(Reporting year 2004)**

1. EXECUTIVE SUMMARY

Directive 98/70/EC¹ sets technical specifications on health and environmental grounds for fuels to be used for vehicles equipped with positive-ignition and compression-ignition engines. Directive 2003/17/EC², amending Directive 98/70/EC, requires a further reduction of the sulphur content of petrol and diesel fuels.

Significant violations of the fuel specification can lead to increased emissions and might even damage the engine and exhaust after-treatment systems. In order to ensure compliance with the fuel quality standards required under this Directive, Member States are required to introduce fuel quality monitoring systems.

Article 8 of Directive 98/70/EC, as amended by Article 1(5) of Directive 2003/17/EC, requires the Commission to publish annually, a report on the fuel quality in the different Member States. This third Commission Report summarises briefly Member States' submissions, on the quality of petrol and diesel, as well as the volumes sold, for the year 2004³. All Member States except France submitted national reports for 2004.

The monitoring of fuel quality in 2004 shows that the specifications for petrol and diesel laid down in Directive 98/70/EC are in general met and few violations were identified. For petrol the main parameters of concern were again research octane number (RON, 34+ samples), summer vapour pressure (DVPE, 43+ samples) and distillation - evaporation at 100°C (17+ samples). For diesel the parameters of concern were sulphur content (22 samples), distillation 95% point (24 samples), cetane number (7+ samples) and density (5+ samples). Although several Member States reported non-compliant samples, far fewer samples exceeded the limit values (and the limits of tolerance for the test methods) compared to previous years. However, both the Czech Republic and Poland reported significant numbers of samples exceeding limit values. The Commission has not identified any negative repercussions on vehicle emissions or engine functioning related to these exceedances but continues to urge Member States to take action in order to ensure full compliance. Most are doing so already, and details of the action taken by Member States with regard to non-compliance are included, where provided, in the individual country chapters of the detailed report for 2004⁴. The Commission will continue insisting that Member States ensure full compliance with the fuel quality requirements laid down in the Directive.

For the abatement of air pollution and the introduction of new engine technology it is important to note that the share of <10 ppm and <50 ppm sulphur fuels increased significantly from 2001 to 2004 for EU-15. EU-10 sulphur content is significantly higher and this leads to a slight increase in average sulphur between 2003 and 2004 for the whole EU. Overall a general trend towards lower sulphur content in petrol and diesel fuel can be identified, as shown in Table 1.

¹ O.J. L 350, 28.12.1998, p. 58

² O.J. L 76, 22.3.2003, p. 10

³ Reporting years 2001 and 2002 are covered by COM(2004) 310 final and 2003 by COM(2005) 69 final

⁴ See http://europa.eu.int/comm/environment/air/pdf/fqm_summary_2004.pdf

Table 1: Annual trend in average sulphur content in petrol and diesel fuels for the EU

	EU 15 average sulphur content, ppm				EU25	EU10	EU15*	
Fuel/Year	2001	2002	2003*	2004*	2004*	2004	2001	2002
<i>Petrol</i>	68	51	37	35	38	64	65	44
<i>Diesel</i>	223	169	125	109	113	149	207	136

*Excludes France, who did not report in 2003 and 2004.

The fuel quality monitoring systems established at national level still differ considerably. However, the requirements of Directive 2003/17/EC are expected to promote greater homogeneity in national monitoring systems and to improve the quality of reporting.

2. INTRODUCTION

The specifications for petrol and diesel sold in the European Union are laid down in Directive 98/70/EC. Two sets of fuel specifications are included in annexes to the Directive, the first entered into force on 1 January 2000 and the second entered into force on 1 January 2005. The Directive also requires Member States to report summaries of the quality of fuels sold in their territories. From 2004 onwards, Member States are required to report on their monitoring in accordance with the new European Standard, EN 14274, or with systems of equivalent confidence. Article 8 of Directive 98/70/EC, as amended by Article 1(5) of Directive 2003/17/EC, requires the Commission to forward the results of Member States' fuel quality reporting. In compliance with this request this third Commission Report summarises the quality of petrol and diesel, as well as the volumes sold, in the Community for the year 2004. The reporting years 2001 and 2002 are covered by the first Commission Report⁵ and 2003⁶ by the second Commission Report. A detailed summary of the national reports can be found on the Commission's web page⁷.

In view of the enlargement of the EU in May 2004, in some cases this report refers to the EU15, by which is meant the EU Member States prior to May 2004, in others it refers to EU10 by which is meant the Member States that joined the EU in May 2004, while in others it refers to EU25 which refers to the EU Member States after May 2004.

3. NATIONAL MONITORING SYSTEMS

A number of different approaches have been used to implement Fuel Quality Monitoring Systems (FQMS) across the EU. These range from those based on European Standard EN 14274⁸, with sampling at a range of fuel retail stations, through to national systems. For example, systems in Sweden and the UK integrate sampling and analysis of all refinery or

⁵ COM(2004) 310 final

⁶ COM(2005) 69 final

⁷ http://europa.eu.int/comm/environment/air/fuel_quality_monitoring.htm

⁸ EN 14274:2003 - Automotive fuels - Assessment of petrol and diesel quality - Fuel Quality Monitoring System (FQMS).

imported batches into the requirements for distribution of fuels within the country. There is also random sampling across the distribution chain throughout the year. The systems active in several Member States were originally designed for other purposes, which explains some of the variations in coverage and application across the EU. A greater degree of homogeneity was expected from 2004, when the amended Directive requires that: *"Member States shall establish a fuel quality monitoring system in accordance with the requirements of the relevant European Standard"* (EN 14274 & EN 14275⁹) from 1 January 2004. Since 2001 - 2003, a significant number of changes have been made to Monitoring Systems. Austria, Finland, Greece, Ireland, Italy and the Netherlands have now moved their systems to ones based upon EN 14274. Portugal has stated it is still in the process of changing its system to comply with EN 14274. Alternative monitoring systems may be permitted by the Directive, provided such systems ensure the results are of an equivalent confidence. So far only Cyprus, Denmark and Malta have provided information justifying their use of National Systems with reduced sampling. Figure 2 summarises the sampling rate across the EU in 2004.

4. 2004 REPORTING

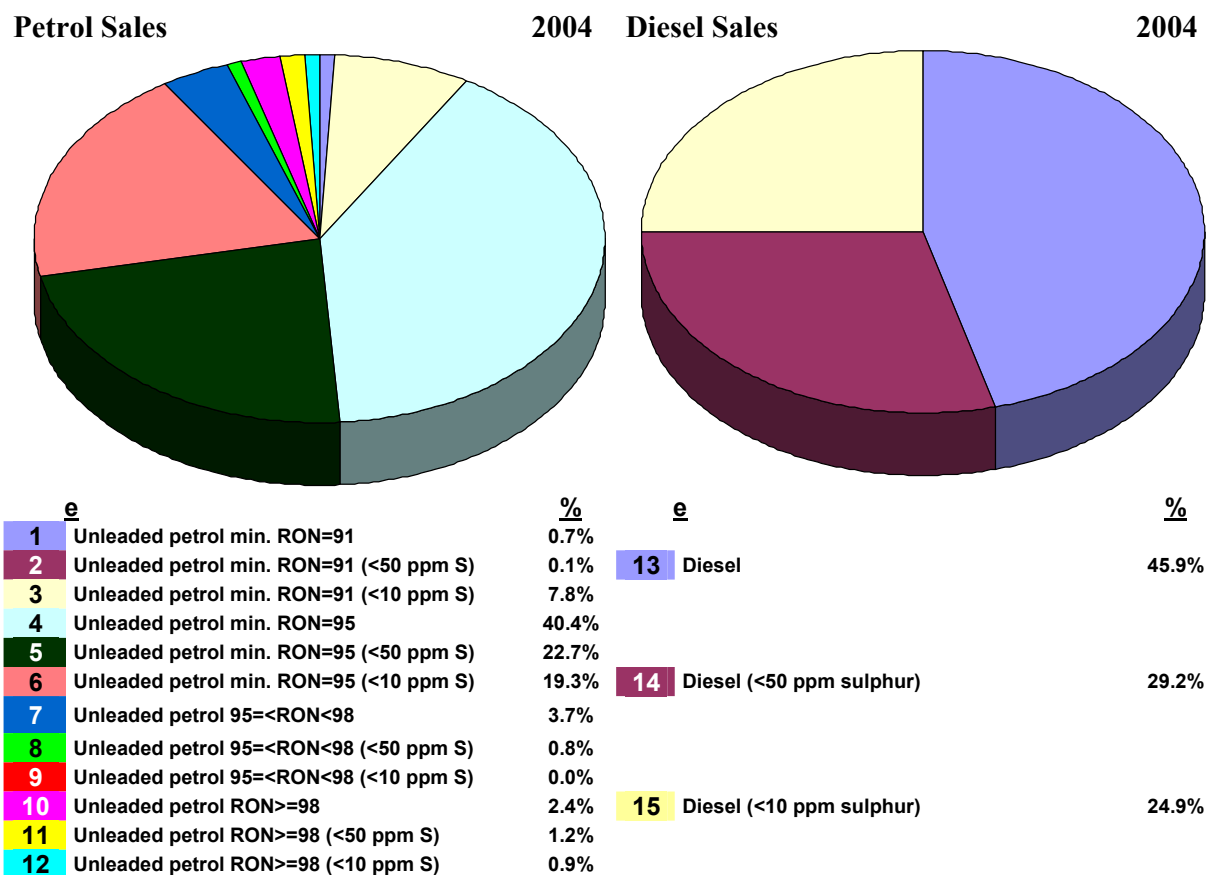
4.1 Fuel Qualities and Volumes

While a wide variety of RON and sulphur grade petrol was available across the EU in 2004, the majority of sales comprised RON95 (82.4%, with 40.4% regular, 22.7% low sulphur and 19.3% sulphur free¹⁰), see Figure 1 and table in the Annex for full details by Member State (no submission was provided by France for 2003 and 2004 fuel quality monitoring). Of all petrol sold, 47% was regular sulphur grade, 25% low sulphur (<50 ppm) and 28% sulphur free (<10 ppm). For diesel, the equivalent split was 46%, 29% and 25%. The proportion containing regular sulphur was slightly higher than reported in 2003. This is primarily because compared to the EU15, much smaller proportions of low sulphur grades were sold in the EU10, with over 90% of petrol and diesel sold being regular grades. EU10 sales comprised 10.0% and 10.3% of total petrol and diesel sales in the EU respectively.

⁹ EN 14275:2003 - Automotive fuels - Assessment of petrol and diesel fuel quality -Sampling from retail site station pumps and commercial site fuel dispensers.

¹⁰ The term "regular" is used for fuels with a sulphur content which is in accordance with Directive 98/70/EC (150 ppm for petrol and 350 ppm for diesel); the term "low sulphur" corresponds to a sulphur content of 50 ppm; the term "sulphur free" to a sulphur content of 10 ppm

Figure 1: EU Fuel sales proportions by fuel type (%)



Similarly to 2001 - 2003, the largest total sales of fuels (of submissions received) in 2004 were made in Germany, Italy, Spain and the United Kingdom (Figure 3). Whilst diesel sales are dominant in many Member States, the relative sales of petrol and diesel vary.

As in 2001 - 2003, there is also still a degree of variation in the number of grades of fuel reported to be available across the EU (Figure 4) in 2004, with more petrol grades available, despite the larger quantities of diesel sold. The distinction between petrol grades is mainly a result of different octane levels (RON category) rather than different sulphur levels. Seven EU15 Member States (two more than in 2001) defined *national fuel grades* for low (<50 ppm) or sulphur free (<10 ppm) fuels in 2004. Reporting of fuel sales is again improved in 2004. No EU10 Member States had separate national low sulphur fuel grades in 2004.

Figure 2: Fuel Quality Monitoring sampling rate across the EU in 2004 (average number of samples per fuel grade)

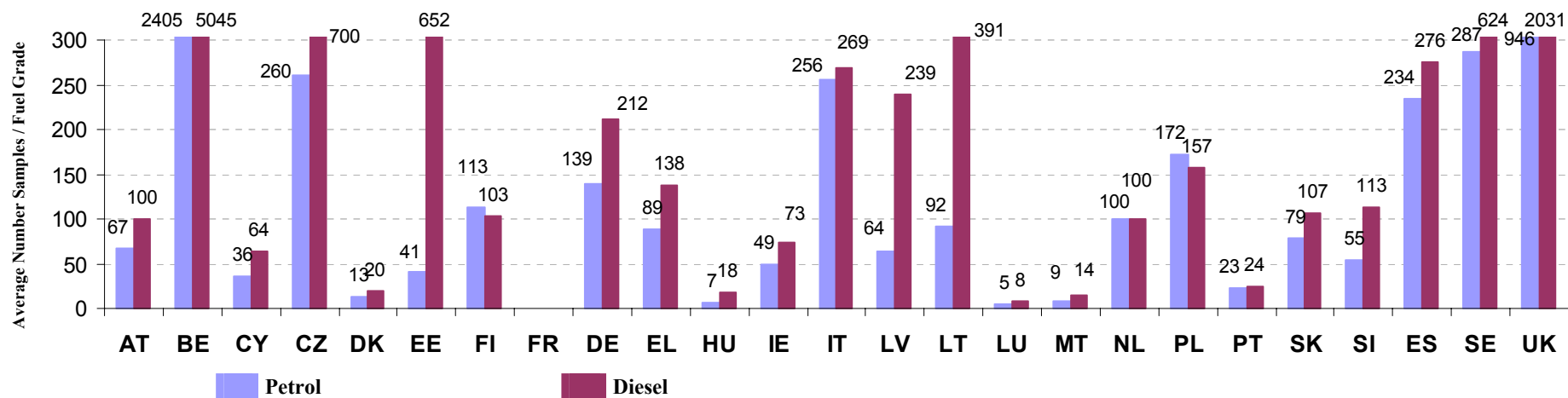


Figure 3: National fuel sales by fuel type across the EU (million litres)*

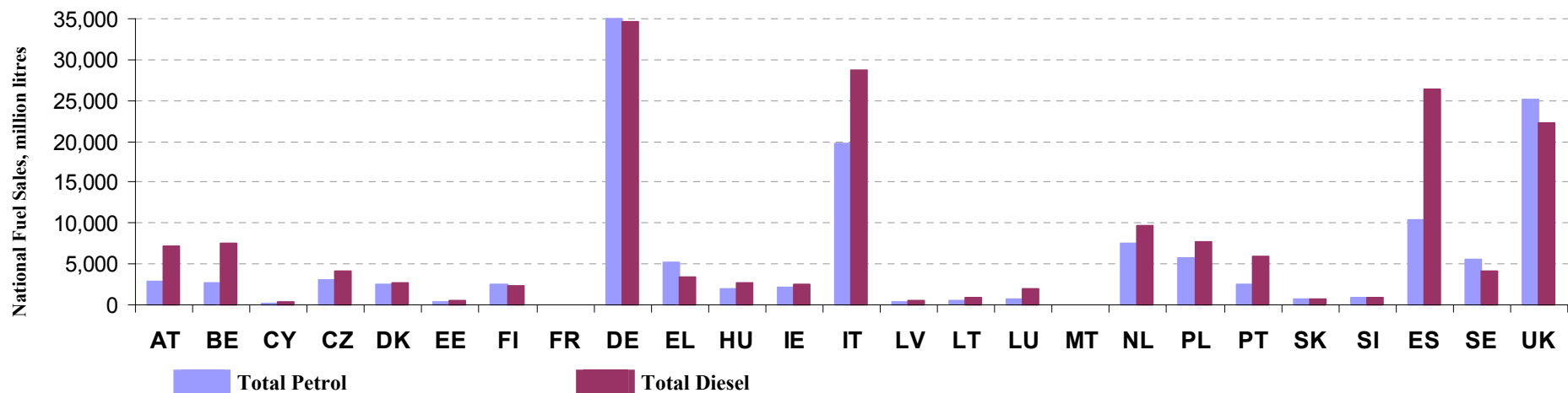


Figure 4: Number of fuel grades available nationally by fuel type across the EU

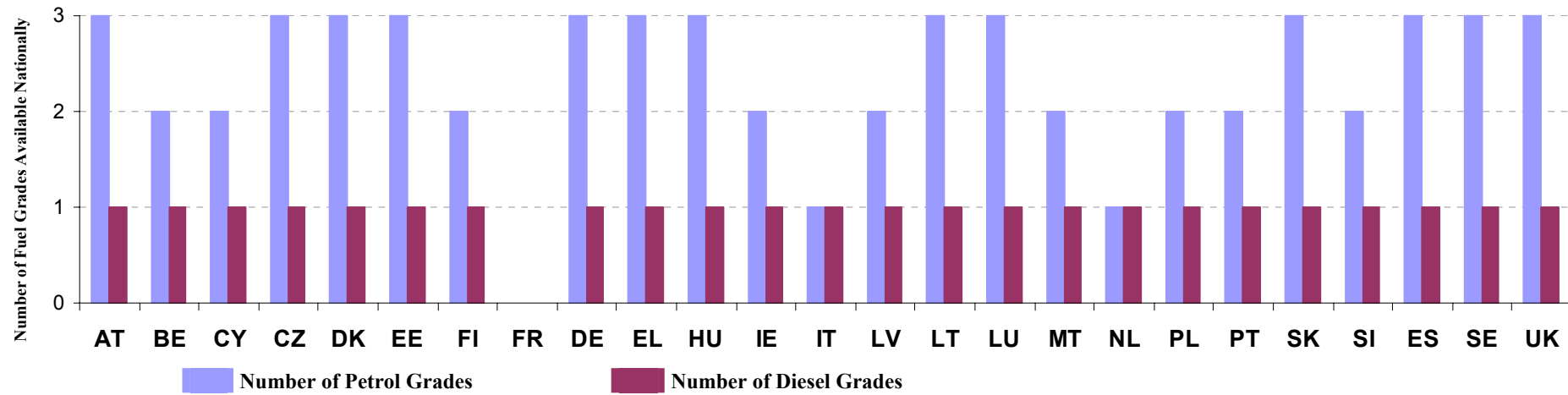


Figure 5: National sales of low sulphur petrol grades across the EU (%)

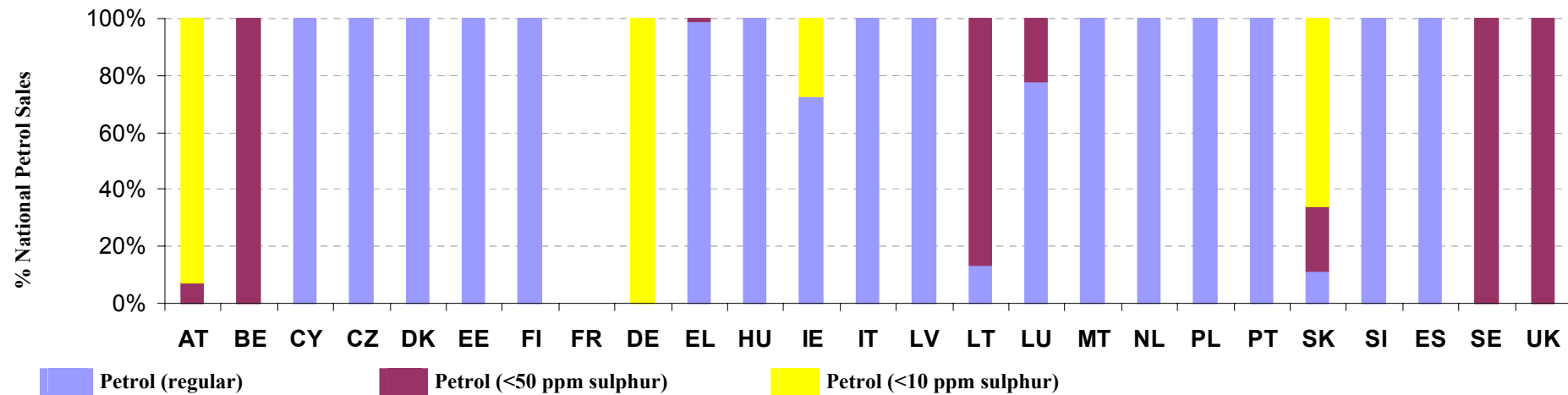


Figure 6: National sales of low sulphur diesel grades across the EU (%)

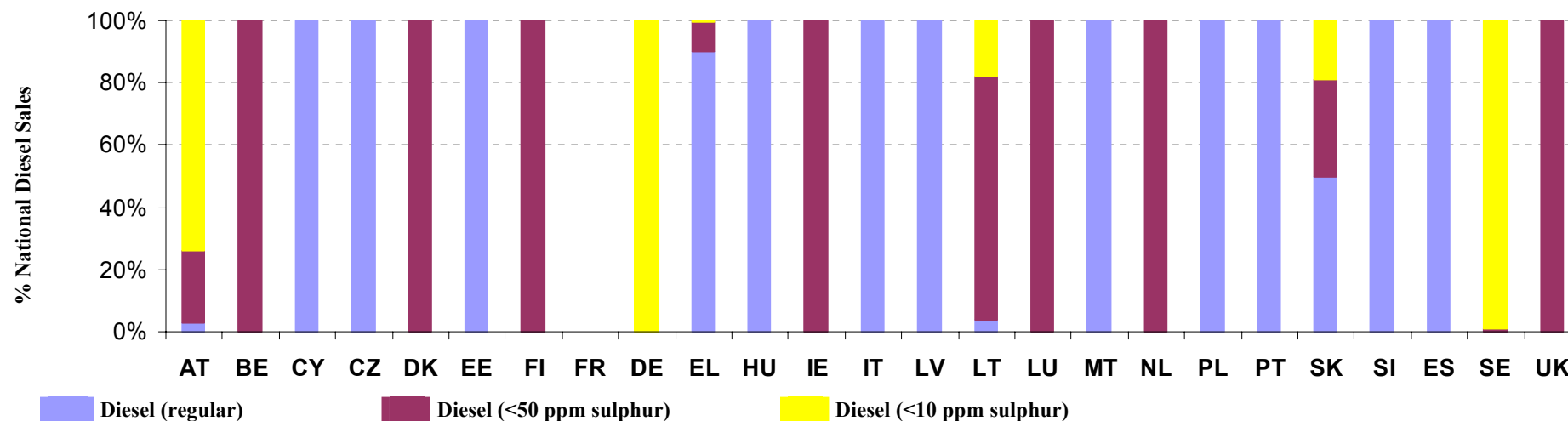
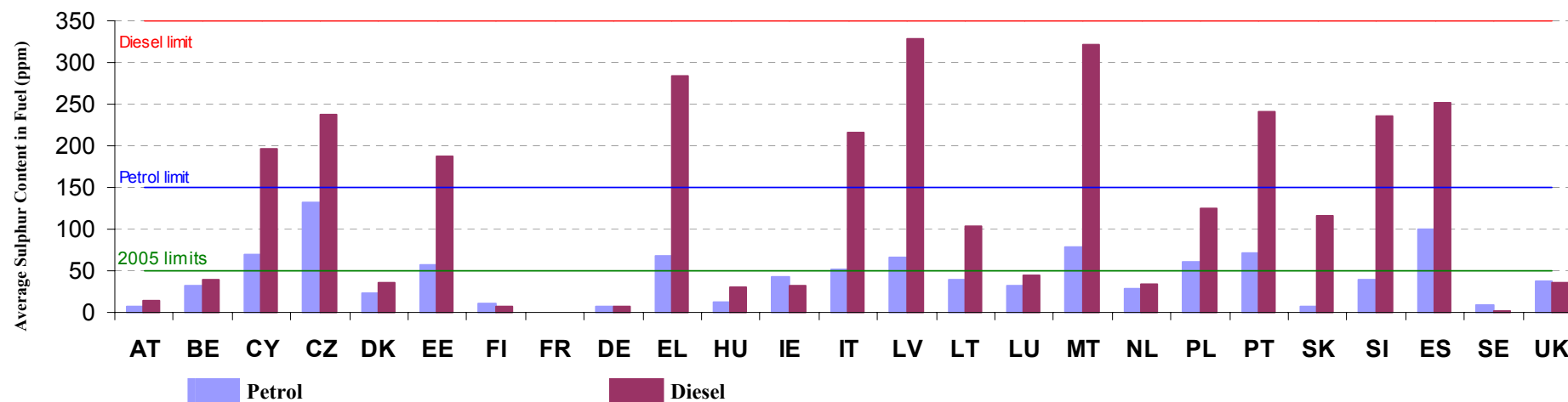


Figure 7: Average sulphur content of petrol and diesel grades across the EU (%)



In 2004, low sulphur fuels were available in many countries across the EU, although mandatory introduction is not required until 2005 (see Figure 5 and Figure 6).

Sulphur free petrol was available in Austria, Germany, Ireland and Slovakia. Sulphur free diesel was available in Austria, Germany, Lithuania, Slovakia and Sweden.

Separate low or sulphur-free fuel grades, or separate sales figures were not available in 2004 in some Member States. However, fuels complying with these criteria were available in many cases, e.g. Belgium, Denmark, Finland, Hungary, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Portugal and Slovakia. This can be seen in Figure 7, which presents the average sulphur content of petrol and diesel grades by Member State across the EU. (Average sulphur content is calculated from the mean sulphur content from reporting on the sampled fuels, weighted to the quantities of different petrol or diesel fuel grades sold). Much of the fuel sold already complies with the 2005 sulphur limit (<50 ppm sulphur in petrol and diesel fuels).

4.2 Compliance with Directive 98/70/EC in 2004

Reports show that 11 Member States are in complete compliance with Directive 98/70/EC limit values for both petrol and diesel for all samples (compared to 5 in 2001 for the EU15). With the exception of oxygenates (for 7 Member States, see notes 3 and 4 of the table), 21 Member States also provided complete reporting across the range of parameters specified for monitoring in the Directive.

In 2004, 13 Member States (6 EU15) reported at least one petrol sample non-compliant with Directive 98/70/EC. This compares with 10 in 2001 and 9 in 2002 and 2003 from EU15. Of these, the main parameters of concern were again research octane number (RON, 34+ samples), summer vapour pressure (DVPE, 43+ samples) and distillation - evaporation at 100°C (17+ samples).

For diesel, 8 Member States (2 EU15) reported at least one sample non-compliant with Directive 98/70/EC. This compares with 4 in 2001, 6 in 2002 and 5 in 2003 from EU15. Of these, the parameters of concern were sulphur content (22 samples), distillation 95% point (24 samples), cetane number (7+ samples) and density (5+ samples).

Although many Member States reported non-compliant samples, far fewer samples exceeded the limit values (and the limits of tolerance for the test methods) compared to previous years. However, both the Czech Republic and Poland reported significant numbers of samples exceeding limit values. Table 2 summarises the compliance of Member States with Directive 98/70/EC for the year 2004 reporting in terms of the results of the analysis of samples against limit values and the reporting format and content. As for 2001 to 2003 the quality of the compliance assessment suffers in a few cases from incomplete information provided by Member States. Details of action taken with regard to limit value non-compliance by Member States are included where provided in the individual country chapters of the detailed report for the year 2004¹¹.

¹¹ See http://europa.eu.int/comm/environment/air/fuel_quality_monitoring.htm

Table 2: Summary of Member State compliance with 98/70/EC for 2004 reporting.

Member State	Limit value non-compliance ⁽¹⁾ (95% confidence limits) [Non-compliant samples / Total samples]		Incomplete reporting [Number of parameters not measured / Total]		Late report (Due by 30/6/2005) ⁽²⁾	Notes
	Petrol	Diesel	Petrol	Diesel		
Austria	1 / 200				<2 months	
Belgium	>14 / 4810	>2 / 5045	1 / 18		<5 months	(3)
Cyprus	4 / 72		6 / 18		<1 month	(4)
Czech Republic	>86 / 780	>40 / 700				
Denmark						
Estonia	4 / 123	35 / 652	11 / 18			(5)
Finland	3 / 226					
France					Not received	
Germany	4 / 417				<2 months	
Greece			7 / 18		<1 month	(4)
Hungary			6 / 18			(4)
Ireland	11 / 97				<2 months	
Italy	6 / 256	6 / 269			<1 month	(6)
Latvia	>1 / 127	>2 / 239			<1 month	
Lithuania			11 / 18	2 / 5	<1 month	(7) (8)
Luxembourg					<5 months	
Malta			4 / 18	1 / 5	<1 month	(9) (10)
Netherlands			6 / 18		<1 month	(4)
Poland	28 / 343	11 / 157				
Portugal			6 / 18			(4)
Slovakia	5 / 238	2 / 107			<1 month	
Slovenia	8 / 109	1 / 113			<1 month	
Spain					<3 months	
Sweden			6 / 18			(4)
UK					<3 months	(11)
No. Countries	13	8	10	2	17	

Notes:

- (1) It is not possible to confirm whether limit values have been respected in all samples, where reporting data is incomplete. Where it has not been possible to establish from submissions the number of samples exceeding the limit value a '>' symbol indicates that the number of samples exceeding limits is a minimum and might be greater.
- (2) Directive 98/70/EC states that Member States should submit monitoring reports by no later than 30th June each year.
- (3) Oxygen content has not been reported
- (4) Oxygenates (other than ethers with more than 5 carbon atoms per molecule) have not been reported. However, in principle, all substances on the list are measured at once using the oxygenate test methods. However, the system has to be calibrated using a calibration sample, containing the same oxygenates in similar proportions as present in the sample under test. It is not clear in most cases, whether this has been carried out, however Italy and Portugal have stated no other oxygenates are added to the fuel. The total organically bound oxygen is calculated from the percentages by mass of the individual components after identification.
- (5) The only petrol parameters measured were RON, DVPE, Distillation, Benzene, Sulphur and Lead.
- (6) Test method EN 1601 employed by Italy for the determination of oxygenate content in petrol samples requires the examination of each sample chromatogram to identify possible oxygen containing components, before the actual determination is carried out. The examination of all sample chromatograms showed that only one oxygenate compound was present in each sample (MTBE, ETBE, TAME); no other oxygenates were detected beside one of these ethers.
- (7) The only petrol parameters measured were RON, Distillation, Aromatics, Benzene and Sulphur. Lithuania has stated the equipment needed for the additional tests were not available in 2004, however arrangements have been made so that 2005 reporting will be complete.
- (8) Cetane number and PAH have not been measured for diesel, however the necessary equipment is available for 2005 monitoring analysis.
- (9) Oxygen content and 3 of the oxygenates were not reported, see comment (4) for clarification on oxygenates test method.
- (10) Cetane index has been measured instead of Cetane number.
- (11) Report delayed due to late delivery of information from one fuel supplier.

The quality of the compliance assessment suffers in some cases due to the incomplete information provided by Member States. Details on specific exceedances are provided in the individual country chapters of the full report. The cases of non-compliance identified seem not to have major negative repercussions on fuel quality in general.

5. CONCLUSIONS

The monitoring of fuel quality in 2004 shows that the specifications for petrol and diesel laid down in Directive 98/70/EC are in general met. Very few violations were identified. The Commission has no indication of any negative repercussions on vehicle emissions or engine functioning due to these violations. The Commission remains concerned about the violations and will continue insisting that Member States ensure full compliance with the fuel quality requirements laid down in the Directive. The amendments to Directive 98/70/EC by Directive 2003/17/EC included the insertion of a new Article 9a which states *"Member States shall determine the penalties applicable to breaches of the national provisions adopted pursuant to this Directive. The penalties determined must be effective, proportionate and dissuasive."* It is expected that the implementation of this requirement will have positive repercussions on compliance.

The share of <10 and <50 ppm fuels increased significantly from 2001 to 2003. However, there was little change between 2003 and 2004 and the expansion of the EU has resulted in a slight reduction in the percentage of these in the overall fuel supply. The lack of identified zero or low sulphur grades limits customers' ability to choose these. This will hamper the introduction of vehicles benefiting from them. The report does not address the extent to which sulphur free fuels were available on a geographical basis – this information is to be provided by Member States in reporting on 2005 monitoring onwards.

The fuel quality monitoring systems established at national level differ considerably and require further uniformity in order to provide transparent and comparable results. The implementation of Directive 2003/17/EC has led to improved quality of reporting as it requires Member States to report on monitoring in accordance to the new European Standard, EN 14274, or with systems of equivalent confidence. There still remain some issues to be addressed and in particular, where Member States do not report according to EN 14274 format, justification for this must be provided.

ANNEX: 2004 EU fuel sales by fuel type (million litres) (Sales for CY, LV and MT are not for the full calendar year, only for May-Dec 2004.)

ID No.	Million litres Fuel grade	Austria AU	Belgium BE	Denmark DK	Finland FI	France FR	Germany DE	Greece EL	Ireland IE	Italy IT	Luxembourg LU	Netherlands NL	Portugal PT	Spain ES	Sweden SE	UK UK	EU15 EU15	EU15 % Total
1	Unleaded petrol min. RON=91	-	-	520	-	-	-	-	-	-	8	-	-	-	-	-	528	0.4%
2	Unleaded petrol min. RON=91 (<50 ppm S)	92	-	-	-	-	-	-	-	-	-	-	-	-	-	-	92	0.1%
3	Unleaded petrol min. RON=91 (<10 ppm S)	672	-	-	-	-	10,013	-	-	-	-	-	-	-	-	-	10,685	8.6%
4	Unleaded petrol min. RON=95	-	-	2,029	2,208	-	-	3,849	2,201	19,704	573	7,501	-	7,976	-	-	45,447	36.4%
5	Unleaded petrol min. RON=95 (<50 ppm S)	121	1,830	-	-	-	-	-	-	-	-	-	-	-	4,905	24,094	30,950	24.8%
6	Unleaded petrol min. RON=95 (<10 ppm S)	1,899	-	-	-	-	23,887	-	-	-	-	-	-	-	-	-	26,381	21.2%
7	Unleaded petrol 95=<RON<98	-	-	-	-	-	-	916	-	-	-	-	1,890	1,259	-	-	4,064	3.3%
8	Unleaded petrol 95=<RON<98 (<50 ppm S)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,097	1,097	0.9%
9	Unleaded petrol 95=<RON<98 (<10 ppm S)	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	4	0.0%
10	Unleaded petrol RON>=98	-	-	20	303	-	-	399	-	-	-	-	574	1,209	640	-	2,506	2.0%
11	Unleaded petrol RON>=98 (<50 ppm S)	-	786	-	-	-	-	61	-	-	167	-	-	-	-	-	1,654	1.3%
12	Unleaded petrol RON>=98 (<10 ppm S)	104	-	-	-	-	1,188	-	-	-	-	-	-	-	-	-	1,292	1.0%
	Petrol (regular)	0	0	2,569	2,512	0	0	5,164	2,201	19,704	582	7,501	2,464	10,445	640	0	52,546	42.1%
	Petrol (<50 ppm sulphur)	213	2,616	0	0	0	0	61	0	0	167	0	0	0	4,905	25,191	33,793	27.1%
	Petrol (<10 ppm sulphur)	2,676	0	0	0	0	35,088	0	4	0	0	0	0	0	0	0	38,362	30.8%
	Total Petrol	2,889	2,616	2,569	2,512	0	35,088	5,225	2,204	19,704	749	7,501	2,464	10,445	5,545	25,191	124,701	100.0%
13	Diesel	215	-	-	-	-	-	3,055	-	28,777	-	-	5,940	26,447	-	-	64,434	40.4%
14	Diesel (<50 ppm sulphur)	1,645	7,579	2,658	2,363	-	-	319	2,474	-	1,947	9,724	-	-	42	22,252	51,004	32.0%
15	Diesel (<10 ppm sulphur)	5,291	-	-	-	-	34,642	13	-	-	-	-	-	-	4,031	-	43,977	27.6%
	Total Diesel	7,150	7,579	2,658	2,363	0	34,642	3,387	2,474	28,777	1,947	9,724	5,940	26,447	4,073	22,252	159,415	100.0%

ID No.	Million litres Fuel grade	Cyprus CY	Czech Republic CZ	Estonia EE	Hungary HU	Latvia LV	Lithuania LT	Malta MT	Poland PL	Slovakia SK	Slovenia SI	EU10 EU10	EU10 % Total
1	Unleaded petrol min. RON=91	-	322	20	12	-	60	-	-	28	-	441	3.2%
2	Unleaded petrol min. RON=91 (<50 ppm S)	-	-	-	-	-	37	-	-	-	-	37	0.3%
3	Unleaded petrol min. RON=91 (<10 ppm S)	-	-	-	-	-	-	-	-	90	-	90	0.6%
4	Unleaded petrol min. RON=95	216	2,714	322	1,812	-	-	43	5,331	61	-	10,498	75.4%
5	Unleaded petrol min. RON=95 (<50 ppm S)	-	-	-	-	-	348	-	-	179	-	527	3.8%
6	Unleaded petrol min. RON=95 (<10 ppm S)	-	-	-	-	-	-	-	-	407	-	407	2.9%
7	Unleaded petrol 95=<RON<98	-	-	-	-	254	-	19	-	-	845	1,118	8.0%
8	Unleaded petrol 95=<RON<98 (<50 ppm S)	-	-	-	-	-	-	-	-	-	-	0	0.0%
9	Unleaded petrol 95=<RON<98 (<10 ppm S)	-	-	-	-	-	-	-	-	-	-	0	0.0%
10	Unleaded petrol RON>=98	45	35	51	168	32	-	-	393	3	52	779	5.6%
11	Unleaded petrol RON>=98 (<50 ppm S)	-	-	-	-	-	8	-	-	-	-	8	0.1%
12	Unleaded petrol RON>=98 (<10 ppm S)	-	-	-	-	-	1	-	-	24	-	25	0.2%
	Petrol (regular)	261	3,070	393	1,992	286	60	61	5,724	92	897	12,836	92.2%
	Petrol (<50 ppm sulphur)	0	0	0	0	0	392	0	0	179	0	571	4.1%
	Petrol (<10 ppm sulphur)	0	0	0	0	0	1	0	0	520	0	522	3.7%
	Total Petrol	261	3,070	393	1,992	286	453	61	5,724	791	897	13,928	100.0%
13	Diesel	272	4,171	492	2,710	458	35	63	7,677	315	894	17,086	93.6%
14	Diesel (<50 ppm sulphur)	-	-	-	-	-	687	-	-	197	-	884	4.8%
15	Diesel (<10 ppm sulphur)	-	-	-	-	-	159	-	-	119	-	277	1.5%
	Total Diesel	272	4,171	492	2,710	458	881	63	7,677	630	894	18,248	100.0%

European Union EU	European Union % Total
969	0.7%
128	0.1%
10,775	7.8%
55,945	40.4%
31,477	22.7%
26,787	19.3%
5,183	3.7%
1,097	0.8%
4	0.0%
3,285	2.4%
1,662	1.2%
1,317	0.9%
65,382	47.2%
34,364	24.8%
38,883	28.0%
138,628	100.0%
81,520	45.9%
51,888	29.2%
44,254	24.9%
177,662	100.0%